

**Estimated Bycatch of Marine Mammals and Sea Turtles in the U.S. Atlantic Pelagic
Longline Fleet During 2016**

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Abstract

The U.S. Atlantic Pelagic Longline fleet operates throughout the western North Atlantic Ocean, including along the U.S. coast from the Gulf of Mexico to New England, the waters of the Caribbean, and in international waters of the North Atlantic Ocean. The Atlantic longline fleet is defined as a Category I fishery under the Marine Mammal Protection Act, and it is also the subject of management under the Endangered Species Act due to interactions with leatherback (*Dermochelys coriacea*) and loggerhead (*Caretta caretta*) turtles. Total bycatch of marine mammals and turtles in the longline fishery was estimated for 2016 using data from the pelagic longline fishery observer program and a mandatory fishery logbook reporting program. We applied a delta-lognormal approach to estimate region specific and total annual interactions with protected species in the fishery. During 2016, there were an estimated 339.5 (256.7 – 449.0 [95% CI]) interactions with leatherback turtles and 153.8 (94.6 – 249.9 [95% CI]) interactions with loggerhead turtles. The primary marine mammals interacting with this fishery were pilot whales (*Globicephala* sp.) in western North Atlantic waters. Interactions were apportioned between short-finned and long-finned pilot whales based upon location and environmental parameters. The majority of interactions were with short-finned pilot whales with an estimated 108.9 (60.9 – 194.7 [95% CI]) interactions resulting in serious injury and an additional 5.1 (1.0 – 26.1 [95% CI]) mortalities in Atlantic waters. Potential sources of bias and uncertainty in these bycatch estimates are discussed.

TABLE OF CONTENTS

Introduction	1
Methodology	3
Geographic Stratification	3
Delta Lognormal Estimator	5
Sea Turtle Life History Form.....	7
Marine Mammal Serious Injury Determination.....	7
Apportioning Pilot Whale Takes Between Species	8
Results and Discussion	10
Reported Fishing Effort and Observer Coverage	10
Observed Protected Species Interactions	11
Estimated Interactions in Unobserved Areas with Fishing Effort	12
Total Estimated Bycatch	13
Trends in Bycatch Estimates.....	13
Sources of Bias and Uncertainty.....	15
Literature Cited	17
List of Tables and Figures	20
Appendix A. Sea Turtle Life History Form	44
Appendix B. Details of Sea Turtle and Marine Mammal Interactions	46

Introduction

Pelagic longline fisheries operate throughout the world's oceans targeting large pelagic fish including swordfish, tunas, and sharks. The U.S. Atlantic Pelagic Longline fleet operates throughout the western North Atlantic Ocean, along the U.S. coast from the Gulf of Mexico to New England, the waters of the Caribbean, and in international waters of the North Atlantic Ocean (Figure 1). The Atlantic longline fleet is defined as a Category I fishery under the Marine Mammal Protection Act (50 CFR Part 229, Federal Register Vol. 69, No. 135, 15 July 2003) due to frequently documented interactions with marine mammals.

The fishery is also the subject of management under the Endangered Species Act (ESA) due to frequent interactions with marine turtles including leatherback (*Dermochelys coriacea*) and loggerhead sea turtles (*Caretta caretta*). In June 2004, a Biological Opinion was issued by the National Marine Fisheries Service, Southeast Regional Office, finding that the U.S. Pelagic Longline Fleet posed a jeopardy to leatherback turtles in the Atlantic Ocean as defined under the ESA. To allow continued operation of the fishery, the Biological Opinion mandated increased reporting of bycatch, required education and outreach programs to train fishers in careful handling and release of turtles, and instituted large-scale changes in fishing gear. Most notably, the fishery was required to exclusively use "circle" hooks (size 16/0 or greater) and to adopt safe handling and release practices for sea turtles after August 2004. These mandates were based upon expected reductions in bycatch rate due to hook shape and size demonstrated by experimental studies conducted in the Northeast Distant Water (NED) fishing area and

an expected reduction in post-release mortality by using the handling and release protocols (Watson *et al.*, 2005).

In addition, several time-area closures were introduced into the fishery in 2000 and 2001 due to concerns over both finfish and protected species bycatch (NMFS 2003, 50 CFR Part 635). These include year-round closures near the De Soto Canyon in the Gulf of Mexico after 1 November 2000 (Figure 1, Label A) and in waters off the Atlantic coast of Florida after 1 March 2001 (Figure 1, Label B). Seasonal closures are in effect in the Charleston Bump region between 1 February and 30 April (Figure 1, Label C) and in a bluefin tuna area off the New Jersey coast between 1 June and 30 June (Figure 1, Label D). The NED area was closed to non-experimental longline fishing from 2001 to 2004 in response to high turtle bycatch. However, with the implementation of gear changes, it was reopened to fishing in June 2004.

In late 2009, regulations were implemented in the fishery to reduce the serious injury and mortality of pilot whales and Risso's dolphins in the Mid-Atlantic Bight region. The Pelagic Longline Take Reduction Plan (PLTRP) was developed based upon consensus recommendations of a team of scientists, managers, and commercial fisheries organizations per the Take Reduction Team process under the MMPA. Regulations were effective on 18 June, 2009 and include restriction of mainline lengths to less than 20 nautical miles in the Mid-Atlantic Bight area and mandatory reporting requirements for fishermen operating in waters offshore of Cape Hatteras, North Carolina (50 CFR Part 229, Federal Register Vol. 74, No. 95, 18 May 2009).

The pelagic longline fishery has had a fishery observer program (Pelagic Observer Program, POP) in place since 1992 to document finfish bycatch, characterize

fishery behavior, and quantify the interactions with protected species (Beerkircher *et al.*, 2004). In addition, a mandatory fishery logbook system (FLS) has been in place since 1992 requiring vessel captains to report fishing effort, gear characteristics, and commercial catch. These data have been used to generate annual estimates of marine mammal and turtle bycatch (Johnson *et al.*, 1999; Yeung, 1999a; Yeung 1999b; Yeung, 2001; Garrison 2003; Garrison and Richards, 2004; Garrison 2005; Fairfield-Walsh and Garrison, 2006, 2007, 2008; Garrison, Stokes, and Fairfield 2009; Garrison and Stokes, 2010, 2012a, 2012b, 2013, 2014, 2016, 2017).

In this report, marine mammal and marine turtle bycatch estimates are calculated for pelagic longline fishery effort during 2016. Bycatch rates (catch per 1000 hooks) are quantified based upon observer data by fishing area and quarter. The estimated bycatch rate is then multiplied by the total fishing effort (number of hooks) reported to the FLS program to obtain estimates of total interactions for each species of marine mammal and turtle.

Methodology

Geographic Stratification

Fishery observer effort is currently allocated among 11 large geographic areas and calendar quarter based upon the historical fishing range of the fleet (Figure 1). The target annual coverage is 8% of the total reported hooks, and observer effort is allocated randomly based upon reported fishing effort during the previous calendar year in each quarter/fishing area stratum (Beerkircher *et al.*, 2004). Between 15 April and 15 June of 2016, observer coverage in the Gulf of Mexico (GOM) fishing area was greatly enhanced to collect more robust information on the interactions between pelagic longline vessels and spawning bluefin tuna. As a result, the observer coverage for this time and area is

dramatically higher than is typical for other strata. Similarly, during December-February, observer coverage was enhanced in portions of the Mid-Atlantic Bight (MAB) to evaluate bluefin tuna bycatch. Observer coverage in this region was therefore high during the first (~70.7% of total hooks) and fourth (20.7% of total hooks) quarters. The bycatch estimates developed for each species are stratified by fishing area and quarter to reflect the design of the observer program. There was no experimental fishing in the pelagic longline fishery during 2016.

Bycatch rates for quarter-area strata with more than 10 reported longline fishery sets that had no corresponding observer coverage in 2016 were replaced with previously observed mean bycatch rates from 2011-2015. There were both marine mammal and sea turtle interactions observed in these “missing” cells in prior years.

The Magnuson-Stevens Fishery Conservation and Management Act places restrictions on reporting fishery information including that collected by observers. NMFS rules therefore restrict the reporting of business information within temporal or spatial strata including fewer than 3 vessels. Business information includes information on the fishing gear or level of effort. As such, the number of sets and hooks cannot be reported in some quarter-area strata in reported effort data, observer data, or both. In cases where by simple calculation one could derive the level of effort in such cells, we have not reported sufficient information to make those calculations. Quarter-area strata where the level of reporting is limited by confidentiality concerns are noted in the appropriate tables.

Delta Lognormal Estimator

Sets in which a portion of the longline broke away, and therefore had multiple recorded haul times, were combined into single sets. This is consistent with the approach of prior estimates (Garrison, 2003; Garrison and Richards, 2004; Garrison, 2005; Fairfield-Walsh and Garrison, 2006; Fairfield-Walsh and Garrison, 2007; Fairfield and Garrison, 2008 Garrison, Stokes, and Fairfield 2009; Garrison and Stokes, 2010, 2012a, 2012b, 2013, 2014, 2016, 2017). The mean and variance of catch rates for marine mammals and turtles observed in longline sets were calculated using a delta lognormal estimator (Pennington, 1983). The delta estimator is more appropriate than the simple mean because catch rates are generally log-normally distributed and bycatch events (i.e., positive sets) are rare. The unit of effort in this analysis is the number of hooks, consistent with methods used to estimate total catch and bycatch of finfish and previous analyses of protected resource interactions (Johnson *et al.*, 1999). The mean bycatch rate for each analytical stratum, t , is calculated as:

$$(1) \quad C_t = \frac{m_t}{n_t} e^{L_t} G\left(s_{L_t}^2 / 2\right),$$

where:

m_t is the number of sets with observed bycatch,

n_t is the total number of observed sets,

L_t is the mean of the log-transformed number of animals taken per 1000 hooks when bycatch occurred,

$s_{L_t}^2$ is the observed sample variance of the log transformed bycatch rate, and G is the cumulative probability function from the Poisson distribution given as:

$$(2) \quad G(s_L^2/2) = 1 + \frac{m_t - 1}{m_t} (s_L^2/2) + \sum_{j=2}^{\infty} \frac{(m_t - 1)^{2j-1}}{m_t^j (m_t + 1)(m_t + 3) \dots (m_t + 2j - 3)} \times \frac{(s_L^2/2)^j}{j!}.$$

The series was computed numerically over j terms until meeting a convergence criterion of a change in the function value of < 0.0001 with additional terms (j). Convergence was generally achieved with < 10 terms. The variance of the delta estimator is:

$$(3) \quad \text{var}(C_t) = \frac{m_t}{n_t} (e^{2L_t}) \left[\frac{m_t}{n_t} G^2(s_L^2/2) - \left(\frac{m_t - 1}{n_t - 1} \right) G\left(\frac{m - 2}{m - 1} s_L^2 \right) \right].$$

When m_t is equal to 1, the mean bycatch rate reduces to the simple mean rate where

$$(4) \quad C_t = \frac{\exp(L_t)}{n_t},$$

and

$$(5) \quad \text{var}(C_t) = \left(\frac{\exp(L_t)}{n_t} \right)^2.$$

The C_t calculated above gives the mean number of animals caught per 1000 hooks in the observed trips. To estimate total interactions, N , these rates are multiplied by the total number of hooks reported to the FLS database for each analytical stratum. The stratified estimates and associated variances were summed to provide annual estimates for each species. Approximate 95% confidence intervals (95% CI) were calculated assuming log-normal distribution of total mortality as N/C and $N \cdot C$ for the lower and upper confidence bounds respectively where:

$$(6) \quad C = \exp [z_{\alpha} \sqrt{\text{var}(\ln N)}],$$

and

$$(7) \quad \text{var}(\ln N) = \ln [1 + \text{var}(N)/N^2],$$

where z_{α} is 1.96, the z score for $\alpha = 0.05$.

Sea Turtle Life History Form

Detailed information on the characteristics of longline interactions with sea turtles was recorded by the fisheries observers during 2016. These data include detailed descriptions of the type of interaction, the extent of entanglement, the location of any hook attached to the animal or swallowed, and other data (Appendix A). Detailed information on entanglement, hooked animals, and the location of hooks are shown in Appendix B.

Marine Mammal Serious Injury Determination

The Marine Mammal Protection Act (MMPA) requires that mortality and serious injury of marine mammals incidental to commercial fishing operations be reduced to a level approaching a zero mortality rate. “Serious injury” has been defined as an injury more likely than not to result in mortality (NOAA Fisheries 50 CFR 229.2, Angliss and DeMaster, 1998). In prior annual reports, serious injury determinations were based upon criteria developed during a workshop of NOAA Fisheries and external experts convened in 1997 (Angliss and DeMaster, 1998). These guidelines were reviewed at a workshop conducted during 2007, and a proposed revision of the criteria for serious injuries in pinnipeds, large whales, and small cetaceans was developed (Andersen et al. 2008). This proposal was reviewed and evaluated by NMFS, and a policy for determining serious vs. non-serious injury in marine mammals with associated criteria was established in 2012

(NMFS 2012a, NMFS 2012b). Observer comments for all takes of marine mammals from 2015 (Appendix B) were reviewed, and serious injury determinations were made on a case by case basis based upon observer comments and photographs (when available) consistent with the 2012 guidelines.

Some observed interactions were scored as “Could Not Be Determined” (CBD) based upon the serious injury criteria. These include two types of cases. First, are those cases where the observer was unable to record sufficient information to allow a definitive determination. These include cases where the animal was involved with the gear in some way, but the observer recorded that it was “unknown if hooked or entangled.” Second, are cases where the animal was released from the gear; however, the duration of time it was involved in the gear or behavioral indicators (e.g., slow swimming, tail slaps, etc.) indicate the possibility that the animal was in distress. Details for each case and the associated score are noted in Appendix B. For observations where the determination was CBD, these cases were apportioned between serious and non-serious injury based upon the proportion of observed cases for that species since 2011 (the year the serious injury guidelines were revised) that were scored as serious injuries. These apportioned cases were therefore split between “serious injury” and “released alive” in the estimation of total bycatch based on past data.

Apportioning Pilot Whale Takes Between Species

Two species of pilot whales, short-finned and long-finned, occur within the MAB and NEC regions and are difficult to reliably identify at sea based upon visual observations. Therefore, nearly all of the observations of pilot whale interactions by

observers have been assigned to “Unidentified Pilot Whales” (*Globicephala sp.*). The region of overlap between the two species is thought to occur between 38-40°N latitude along the shelf break during warm months of the year. In the past decade, there have been very few interactions observed north of 38.5°N. Available data from studies directed at understanding the relative distribution of the two species based upon genetic and photo-identification data demonstrated that long-finned pilot whales did not occur this far south, and therefore all pilot whale takes were presumed to be from short-finned pilot whales. However, during 2016, there were 6 interactions with pilot whales in the NEC and several in the northern part of the MAB where overlap between the species is possible, and therefore it was unclear whether or not these takes could be reliably assigned to short-finned vs. long-finned pilot whales.

There have been 542 biopsy skin samples collected from pilot whales in the MAB and NEC regions between 1989-2014 from both directed field studies and fisheries bycatch. This included 10 genetic identifications of samples collected from the pelagic longline fishery from 2009-2014. These samples have been analyzed genetically and identified to species. All of the samples collected from the pelagic longline fishery have to date been identified as short-finned pilot whales. A logistic regression model was used to estimate the probability that an observed pilot whale was a short-finned vs. long-finned pilot whale based upon the location and sea surface temperature at the time of the sample collection. The model used samples that were collected during May-November, as these were most representative of the period when pilot whale bycatch in the pelagic longline fishery is observed. The resulting model indicated that at water temperatures above 22°C

and latitudes south of 39°N, the probability of a sample coming from a short-finned pilot whale exceeds 80% (see Garrison and Rosel, 2016 for additional detail).

Of the 21 observed pilot whale interactions during 2016 (excluding 2 in the Gulf of Mexico), all had a greater than 95% probability of being from short-finned pilot whales. For all observed unidentified pilot whales, the predicted probability of it being short-finned vs. long-finned was used to apportion the estimated bycatch between the two species. Due to the very low probability of the observed takes being from long-finned pilot whales, the estimated bycatch of this species was very low compared to that for short-finned pilot whales.

Results and Discussion

Reported Fishing Effort and Observer Coverage

The total reported pelagic longline fishing effort included 5.2 million hooks during 2016 (Table 1A, Figure 2). The reported fishery effort included 6,925 sets during 2016, 1,220 of which were observed by the POP program (Tables 1B and 2B, Figure 2). The overall percent coverage during regular fishing was 16.8% expressed as a proportion of reported hooks and 17.6% as a proportion of reported sets (Table 3). The relatively high annual rate reflects the high coverage of the fishery during the first and second quarters in the GOM and the high coverage of the MAB during Quarters 1 and 4. Observer coverage for other area-quarter strata is shown in Table 3.

Areas with no observer coverage during 2016 with more than 10 sets of reported fishing effort include the Northeast Coastal (NEC) during Quarter 2, CAR during

quarters 2 and 3, North Central Atlantic (NCA) during quarter 3, and the Tuna North (TUN) during Quarter 3 (Table 3).

Observed Protected Species Interactions

There were 69 observed interactions with leatherback turtles, 19 with loggerhead turtles, and 3 unidentified turtle (Table 4, Figure 3) in 2016. The greatest number of observed leatherback takes occurred in the GOM during Quarters 1 and 2 (Table 4A, Figure 3). Loggerhead takes were observed in the greatest numbers in the FEC during Quarter 1 and the SAB during Quarter 2 (Table 4B, Figure 3).

The vast majority of the turtles were characterized as being released alive and injured (i.e., most had been hooked) based upon recorded information on the sea turtle life history form (Table 5). Leatherback turtles were most typically hooked externally, while loggerhead turtles were primarily hooked in the mouth or beak or had swallowed the hook (Table 5). All gear was removed before release from 27 of the 91 turtles captured (Table 6). A total of 27 leatherbacks were released either entangled or with the hook and line remaining that was $> \frac{1}{2}$ the carapace length (Table 6).

There were 33 interactions observed with marine mammals (Table 7, Figure 4). This included 23 interactions with pilot whales, and none of these were sampled to allow direct identification to species. However, 2 were identified as short-finned pilot whales since they were observed in the GOM and FEC areas where long-finned pilot whales do not occur (Table 8). Seventeen of the observed marine mammal interactions were categorized as serious injuries including 15 pilot whales (Table 9). Eleven of the serious injuries were due to animals being hooked in the mouth/head, 5 cases involved being

released with gear likely to further entangle the animal, and there was one case where the gear was removed but other factors indicated likely serious injury (Table 9). There were 8 cases where a determination could not be made, and the interaction was therefore pro-rated based on historical serious injury rates. Observer comments used in serious injury determinations are summarized in Appendix B.

Stratum estimates of total interactions for sea turtles are shown in Table 10. High numbers of leatherback interactions occurred particularly in the GOM during Quarter 2 (45.5), in the MAB in Quarter 3 (40.0) and the NED in and Quarter 3 (52.3, Table 10). For loggerhead turtles, the estimated interactions were highest in the FEC and SAB (Table 10).

The quarter-area strata estimates for observed marine mammal mortality, serious injury, and live releases are presented in Table 11. The highest level of serious injuries occurred for short-finned Pilot whales in the MAB during Quarters 3 and 4.

Estimated Interactions in Unobserved Areas with Fishing Effort

The average bycatch rates and estimated catches in strata that were not observed during 2016 are summarized in Table 12. There were observed sea turtle takes in prior years in NEC-Quarter 2 for both leatherback and loggerhead turtles (Table 12). There also observed interactions with Risso's dolphins in prior years in NEC-Quarter 2.

Total Estimated Bycatch

There were an estimated total of 339.5 (256.7 – 449.0 [95% CI]) interactions with leatherback turtles during 2016 (Table 13). For loggerhead turtles, the estimated total number of interactions was 153.8 turtles (94.6 – 249.9 [95% CI], Table 13).

Annual estimates of marine mammal bycatch are shown in Table 14 with catch estimates separated among three large regions: Atlantic (FEC, SAB, MAB, and NEC), Gulf of Mexico (GOM), and Offshore (CAR, NED, SAR, and NCA). There were no interactions observed in Offshore strata, which correspond to regions outside of the U.S. EEZ, while Gulf and Atlantic correspond to boundaries between western North Atlantic and Gulf of Mexico stocks of the affected species. The highest number of interactions and serious injuries were with Atlantic short-finned pilot whales with a total of 14.6 (CV = 0.56) animals released alive, 108.9 (CV = 0.30) animals seriously injured, and 5.1 (CV = 1.0) dead (Table 14a). While two interactions were observed with pilot whales in the NEC where long-finned pilot whales occur, there was a high probability that these animals were short-finned pilot whales based upon environmental conditions and the location of the interactions. The low likelihood that these were long-finned pilot whales is reflected by the small estimate of interactions for this species.

Trends in Bycatch Estimates

The leatherback take estimate reached a historical high in 2004, and prior to that had increased sharply since 1998 (Figure 5A). A significant decrease in the leatherback bycatch rate and the annual estimated number of interactions with leatherback turtles

occurred beginning in 2005 after the implementation of regulations in August 2004. The estimated take of leatherback turtles remained low and generally trended downward during 2007-2011, and then sharply increased in 2012 associated with an increase in reported fishing effort. The estimates have returned to a downward trend in recent years. The estimate for 2016 is consistent with that for 2014-2015 despite an ongoing decrease in reported fishery effort. The estimate for 2016 is consistent with those during the period from 2004-2011.

Loggerhead turtle interactions since 2000 have been below the historical highs that occurred in the mid-1990's (Figure 5B). Following the implementation of regulations, the bycatch dropped in 2005, but rebounded to be similar to the pre-regulation period. There appears to be a cyclic pattern in loggerhead bycatch rate occurring at 4 year intervals since 1996 with a generally increasing trend over a four year period, followed by a sharp decline. This cycle continued during the 2010-2015 period. The 2014-2016 estimates remain relatively low and seem to be consistent with an overall downward trend since the late 1990's. There has been a downward trend in loggerhead turtle takes since 2012.

For pilot whales (unspecified and short-finned pilot whales combined), the 2016 estimate was lower than that from 2015, but has remained relatively constant since 2011 (Figure 6). The bycatch estimate for Risso's dolphins was very low, consistent with that since 2013 (Figure 6).

Sources of Bias and Uncertainty

The fishery logbook system is a mandatory reporting program, and thus it is expected that reporting rates are generally high. Due to the intense management focus on the longline fishery, there has been close monitoring of reporting rates, and observed trips can be directly linked to reported effort. In general, the gear characteristics and amount of observed effort is consistent with the reported effort. However, reporting errors are possible in this fishery that would result in a bias in bycatch estimates.

Observer coverage in the pelagic longline fishery is generally high, particularly in comparison to that of other commercial fisheries. The sampling level is sufficient to provide reasonably precise estimates of interactions with protected species. The observed coefficients of variation for annual estimates of both loggerhead and leatherback turtles are below the 30% benchmark established by guidelines for precision set by NOAA Fisheries.

The delta estimator was applied to calculate bycatch rates primarily to maintain consistency with previous estimates for this fishery (Johnson *et al.*, 1999; Yeung, 1999a; Yeung, 1999b; Yeung, 2001; Garrison, 2003; Garrison and Richards, 2004; Garrison, 2005; Fairfield-Walsh and Garrison, 2006, 2007, 2008; Garrison, Stokes, and Fairfield 2009; Garrison and Stokes, 2010, 2012a, 2012b, 2013, 2014, 2016). This approach assumes that: 1) catch rates (animals per hook) are log-normally distributed, and 2) the number of hooks is an appropriate unit of effort. The first assumption was critically examined for sea turtles in Johnson *et al.* (1999); however, it is difficult to verify for marine mammals given the generally low rate of these interactions. The delta estimator is sensitive to the assumption of log-normality, and violations of this assumption may

result in biased (positive or negative) estimates of catch rate and associated variances.

The second assumption has not been examined critically in previous analyses. The current approach assumes that total bycatch is linearly related to the total number of hooks fished. If this assumption is not correct, for example if there are saturation effects resulting in a non-linear relationship between the number of hooks and total catch, then there is potentially a bias, of unknown direction and magnitude, in the estimate of total bycatch.

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List of Tables and Figures

Table 1. Total amount of fishing effort reported to the pelagic longline logbook program during 2016 by quarter and fishing area. Fishing effort is reported as A) Number of hooks (thousands) and B) Number of sets. NR indicates strata where effort cannot be reported due to confidentiality considerations.

Table 2. Total amount of fishing effort observed during 2016 by quarter and fishing area. Fishing effort is reported as A) Number of hooks (thousands) and B) Number of sets. Dashes indicate cells where no fishery effort was reported. NR indicates strata where effort cannot be reported due to confidentiality considerations.

Table 3. Percentage of reported fishing effort observed during 2016 by quarter and fishing area by A) Number of hooks and B) Number of sets. Dashes indicate no reported fishing effort. Cells in which >10 longline sets were reported with no observer coverage are indicated in bold. Totals indicate overall percentage coverage by area and quarter.

Table 4. Total number of observed interactions with A) Leatherback turtles, B) Loggerhead turtles, and C) All sea turtles in the pelagic longline fishery during 2016 by quarter and fishing area. Dashes indicate areas where there was no observed fishing effort, and an X indicates an area where no effort was reported.

Table 5. Summary of A) Release condition, B) Hook location in hooked animals, and C) Animals with all gear removed, by hook location for sea turtles observed in the pelagic longline fishery during 2016. Hook location information is recorded on the sea turtle life history form (Appendix A) by the observer.

Table 6. Release status and gear removal for sea turtles captured and released alive in the U.S. Atlantic Pelagic Longline Fishery during 2016. Counts include turtles captured during experimental fishing. Condition columns refer to post-release mortality categories in Table 1 of SEFSC (2012).

Table 7. Total number of marine mammals observed in interactions with the pelagic longline fishery during 2016 by quarter and fishing area. Dashes indicate areas where there was no observed fishing effort, and an X indicates an area where no effort was reported.

Table 8. Marine mammal interactions with the pelagic longline fishery during 2016 by species, quarter, and fishing area.

Table 9. Summary of release condition and serious injury types for marine mammals observed in the pelagic longline fishery during 2016. Serious injury determinations were based upon written observer comments (Appendix B). “Entangled” indicates that the animal was released with line remaining attached that is likely to further entangle the animal. Codes indicate table injury categories defined in the Small Cetacean Serious Injury Guidelines (NMFS, 2012a,b).

Table 10. Estimated interactions with sea turtles in the pelagic longline fishery during 2016 by fishing area and quarter indicates strata where effort cannot be reported due to confidentiality considerations.

Table 11. Estimated A) Mortalities, B) Serious Injury, C) Released Alive, and D) Total Interactions with marine mammals in the pelagic longline fishery during 2016 by fishing area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations.

Table 12. Bycatch rates for sea turtles in area-quarter strata with reported effort that were not observed in 2016.

Table 13. Total estimated interactions and experimental takes for A) Leatherback and B) Loggerhead turtles in the pelagic longline fishery during 2016 by fishing area. This includes estimates for strata that were not observed during 2016.

Table 14. Total estimated interactions with marine mammals in the pelagic longline fishery during 2016.

Figure 1. Pelagic longline fishing areas in the North Atlantic Ocean: CAR = Caribbean, GOM = Gulf of Mexico, FEC = Florida East Coast, SAB = South Atlantic Bight, SAR = Sargasso Sea, MAB = Mid-Atlantic Bight, NEC = Northeast Coastal, NED = Northeast Distant, NCA = North Central Atlantic, TUN = Tuna North. Year-round closed areas in the DeSoto Canyon (A) and the Florida East Coast (B) are indicated along with seasonal closures in the Charleston Bump (C) and in the Mid-Atlantic (D).

Figure 2. Observed and reported pelagic longline fishing effort during 2016.

Figure 3. Observed pelagic longline fishing effort and sea turtle takes during 2016.

Figure 4. Observed pelagic longline fishing effort and marine mammal takes during 2016.

Figure 5. Historical trends in fishery effort and estimated marine turtle takes in the pelagic longline fishery between 1992 and 2016 for A) Leatherback Turtles, and B) Loggerhead Turtles. Errors bars represent 95% confidence intervals.

Figure 6. Historic trends in fishery effort and estimated marine mammal takes in the pelagic longline fishery from 1992 to 2016 for A) Pilot Whales and B) Risso's Dolphins. Errors bars represent 95% confidence intervals.

Table 1. Total amount of fishing effort reported to the pelagic longline logbook program during 2016 by quarter and fishing area. Fishing effort is reported as A) Number of hooks (thousands) and B) Number of sets. NR indicates strata where effort cannot be reported due to confidentiality considerations.

A. Number of Hooks (thousands)

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	1.0	319.9	353.0	35.2	0.0	3.1	0.0	152.8	59.7	27.2	952.0
2	52.7	101.5	474.3	220.3	0.0	92.6	0.0	641.9	0.0	48.9	1632.0
3	57.9	82.8	458.1	440.2	12.1	244.6	161.7	82.6	0.0	17.3	1557.3
4	46.8	122.5	365.3	286.1	5.5	38.7	48.4	70.1	57.2	67.8	1108.3
Total	158.3	626.7	1650.7	981.7	17.7	379.0	210.0	947.5	116.9	161.1	5249.6

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	1	431	449	67	0	4	0	187	70	35	1244
2	58	144	631	351	0	110	0	716	0	50	2060
3	62	129	677	664	11	262	163	132	0	19	2119
4	53	176	490	454	6	41	60	104	66	52	1502
Total	174	880	2247	1536	17	417	223	1139	136	156	6925

Table 2. Total amount of fishing effort observed during 2016 by quarter and fishing area. Fishing effort is reported as A) Number of hooks (thousands) and B) Number of sets. Dashes indicate cells where no fishery effort was reported. NR indicates strata where effort cannot be reported due to confidentiality considerations.

A. Number of Hooks (thousands)

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	0.0	30.8	133.4	24.9	-	0.0	-	21.7	4.0	7.2	222.1
2	0.0	14.6	169.0	14.4	-	0.0	-	77.1	-	13.7	288.9
3	0.0	8.9	60.0	42.3	0.0	56.4	19.1	14.5	-	0.0	201.3
4	8.1	9.4	31.9	59.1	0.0	11.3	8.1	14.9	1.6	27.6	172.0
Total	8.1	63.7	394.4	140.8	0.0	67.7	27.3	128.3	5.6	48.5	884.4

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	0	49	173	50	-	0	-	33	5	10	320
2	0	24	233	28	-	0	-	101	-	11	397
3	0	14	82	65	0	54	30	19	-	0	264
4	9	14	41	104	0	14	11	24	2	20	239
Total	9	101	529	247	0	68	41	177	7	41	1220

Table 3. Percentage of reported fishing effort observed during 2016 by quarter and fishing area by A) Number of hooks and B) Number of sets. Dashes indicate no reported fishing effort. Cells in which >10 longline sets were reported with no observer coverage are indicated in bold. Totals indicate overall percentage coverage by area and quarter.

A. Number of Hooks

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	0.0	9.6	37.8	70.7	-	0.0	-	14.2	6.8	26.6	23.3
2	0.0	14.4	35.6	6.5	-	0.0	-	12.0	-	28.0	17.7
3	0.0	10.8	13.1	9.6	0.0	23.1	11.8	17.6	-	0.0	12.9
4	17.3	7.7	8.7	20.7	0.0	29.3	16.8	21.2	2.7	40.7	15.5
Total	5.1	10.2	23.9	14.3	0.0	13.0	17.9	13.5	4.8	30.1	16.8

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	0.0	11.4	38.5	74.6	-	0.0	-	17.6	7.1	28.6	25.7
2	0.0	16.7	36.9	8.0	-	0.0	-	14.1	-	22.0	19.3
3	0.0	10.9	12.1	9.8	0.0	20.6	18.4	14.4	-	0.0	12.5
4	17.0	8.0	8.4	22.9	0.0	34.1	18.3	23.1	3.0	38.5	15.9
Total	5.2	11.5	23.5	16.1	0.0	16.3	18.4	15.5	5.1	26.3	17.6

Table 4. Total number of observed interactions with A) Leatherback turtles, B) Loggerhead turtles, and C) All sea turtles in the pelagic longline fishery during 2016 by quarter and fishing area. Dashes indicate areas where there was no observed fishing effort, and an X indicates an area where no effort was reported. *One unidentified was captured in the MAB in Quarter 1, **1 unidentified turtles was captured in the GOM in Quarter 1, and ***1 unidentified turtle was captured in the GOM in quarter 3. Counts exclude one Leatherback turtle recorded from an unobserved haul in the NED during quarter 3.

A. Leatherback Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	-	3	12	0	X	-	X	1	0	0	16
2	-	0	16	0	X	-	X	0	X	1	17
3	-	0	0	4	-	5	6	1	X	-	16
4	0	0	0	6	-	6	6	2	0	0	20
Total	0	3	28	10	-	11	12	4	0	1	69

B. Loggerhead Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	-	4	1	0	X	-	X	2	0	0	7
2	-	1	0	0	X	-	X	4	X	0	5
3	-	1	0	0	-	1	0	1	X	-	3
4	1	0	0	2	-	0	1	0	0	0	4
Total	1	6	1	2	-	1	1	7	0	0	19

C. All Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	-	7	14**	1*	X	-	X	3	0	0	25
2	-	1	16	0	X	-	X	4	X	1	22
3	-	1	1***	4	-	6	6	2	X	0	20
4	1	0	0	8	-	6	7	2	0	0	25
Total	1	9	31	13	-	12	13	11	0	1	91

Table 5. Summary of A) Release condition, B) Hook location in hooked animals, and C) Animals with all gear removed, by hook location for sea turtles observed in the pelagic longline fishery during 2016. Hook location information is recorded on the sea turtle life history form (Appendix A) by the observer. Counts exclude one Leatherback turtle recorded from an unobserved haul in the NED during quarter 3.

A. Capture condition

Species	Alive, Uninjured	Alive, Unknown	Alive, injured	Dead	Unknown	Total
Leatherback	13	4	51	1	0	69
Loggerhead	1	0	17	1	0	19
Unidentified	1	0	1	0	1	3
Total	15	4	69	2	1	91

B. Hook Location in hooked animals

Species	Not Hooked	Unknown if Hooked	Hooked, Location Unknown	Internal			External	Total
				Unknown Internal	Swallowed	Beak or Mouth		
Leatherback	15	5	12	2	0	2	33	69
Loggerhead	1	0	0	0	5	11	2	19
Unidentified	1	0	2	0	0	0	0	3
Total	17	5	14	2	5	13	35	91

C. Animals with all gear removed, by hook location

Species	Not Hooked	Unknown if Hooked	Hooked, Location Unknown	Internal			External	Total
				Unknown Internal	Swallowed	Beak or Mouth		
Leatherback	13	1	1	0	0	0	3	18
Loggerhead	1	0	0	0	0	5	2	8
Other Species	1	0	0	0	0	0	0	1
Total	15	1	1	0	0	5	5	27

Table 6. Release status and gear removal for sea turtles captured and released alive in the U.S. Atlantic Pelagic Longline Fishery during 2016. Condition columns refer to post-release mortality categories in Table 1 of SEFSC 2012. Counts exclude one leatherback turtle recorded from an unobserved haul in the NED during quarter 3.

Release Status	Leatherback	Loggerheads	Unidentified Turtles
Released entangled (Condition Column A)	7	0	0
Released with hook and line $\geq \frac{1}{2}$ carapace length (Condition Column B)	20	0	1
Released with hook and line $< \frac{1}{2}$ carapace length (Condition Column C)	23	10	0
Released with all gear removed (Condition Column D)	18	8	1
Dead	1	1	0
Unknown	0	0	1

Table 7. Total number of marine mammals observed in interactions with the pelagic longline fishery during 2016 by quarter and fishing area. Dashes indicate areas where there was no observed fishing effort, and an X indicates an area where no effort was reported.

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	-	0	2	3	X	-	X	0	0	0	5
2	-	1	0	2	X	-	X	2	X	0	5
3	-	0	0	3	-	2	0	1	X	-	6
4	0	0	0	11	-	6	0	0	0	0	17
Total	0	1	2	19	-	8	0	3	0	0	33

Table 8. Marine mammal interactions with the pelagic longline fishery during 2016 by species, quarter, and fishing area. CBD indicates that the serious injury status could not be determined from available information. These observed interactions were prorated based on past observed serious injury rates.

Species	Quarter	Fishing Area	Serious Injuries	CBD	Released Alive	Dead	Total
Risso's Dolphin	3	NEC	1	1	0	0	2
Risso's Dolphin	3	SAB	0	0	0	1	1
Risso's Dolphin	4	MAB	0	0	1	0	1
Unidentified Dolphin	1	MAB	1	0	0	0	1
Unidentified Dolphin	3	MAB	0	0	1	0	1
Unidentified Marine Mammal	1	GOM	0	0	1	0	1
Unidentified Marine Mammal	1	MAB	0	1	0	0	1
Pilot Whales	1	MAB	1	0	0	0	1
Pilot Whales	2	MAB	2	0	0	0	2
Pilot Whales	2	SAB	1	0	0	0	1
Pilot Whales	3	MAB	1	0	0	0	1
Pilot Whales	4	MAB	6	3	1	0	10
Pilot Whales	4	NEC	3	2	1	0	6
Short-finned Pilot Whale	1	GOM	1	0	0	0	1
Short-finned Pilot Whale	2	FEC	0	0	0	1	1
Unidentified Whale	3	MAB	0	1	0	0	1
Total			17	8	6	2	33

Table 9. Summary of release condition and serious injury types for marine mammals observed in the pelagic longline fishery during 2016. Serious injury determinations were based upon written observer comments (Appendix B). Codes indicate table injury categories defined in the Small Cetacean Serious Injury Guidelines (NMFS, 2012a,b). CBD indicates that the serious injury status could not be determined from available information. These observed interactions were prorated based on past observed serious injury rates.

Species	Alive	CBD	Dead	Serious Injury Type			Serious Injury Total	Total
				Hooked in Head/Mouth (S5a)	Gear Attached Likely to Entangle (S6)	Freed After Entanglement (S7b)		
Risso's dolphin	1	1	1	0	0	1	1	4
Unid. Marine Mammal	1	1	0	0	0	0	0	2
Pilot Whale	3	5	0	11	4	0	15	23
Unid. dolphin	1	0	0	0	1	0	1	2
Short-finned pilot whale	0	0	1	0	0	0	0	1
Unid. Whale	0	1	0	0	0	0	0	1
Total	6	8	2	11	5	1	17	33

Table 10. Estimated interactions with sea turtles in the pelagic longline fishery during 2016 by fishing area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations.

A. Leatherback

Status	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV	Hooks Reported (x1000)	Estimated Catch
Alive	FEC	1	3	49	0.0977	0.5684	319.9	31.3
Alive	GOM	1	12	173	0.0877	0.2806	353.0	31.0
Alive	GOM	2	14	233	0.0959	0.2712	474.3	45.5
Alive	MAB	3	4	65	0.0909	0.4932	440.2	40.0
Alive	MAB	4	5	104	0.0815	0.4523	286.1	23.3
Alive	NEC	3	5	54	0.1129	0.4890	244.6	27.6
Alive	NEC	4	4	14	0.6102	0.5458	38.7	23.6
Alive	NED	3	6	30	0.3233	0.3905	161.7	52.3
Alive	NED	4	3	11	0.6585	0.5917	48.4	31.8
Alive	SAB	1	1	33	0.0436	1.0000	152.8	6.7
Alive	SAB	3	1	19	0.0532	1.0000	82.6	4.4
Alive	SAB	4	1	24	0.1457	1.0000	70.1	10.2
Alive	TUN	2	1	11	0.0748	1.0000	48.9	3.7
Dead	GOM	2	1	233	0.0075	1.0000	474.3	3.6

Table 10 – Continued

B. Loggerheads

Status	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV	Hooks Reported (x1000)	Estimated Catch
Alive	CAR	4	1	9	0.1310	1.0000	46.8	6.1
Alive	FEC	1	3	49	0.1098	0.6038	319.9	35.1
Alive	FEC	2	1	24	0.0498	1.0000	101.5	5.1
Alive	FEC	3	1	14	0.1050	1.0000	82.8	8.7
Alive	GOM	1	1	173	0.0120	1.0000	353.0	4.3
Alive	MAB	4	2	104	0.0332	0.7041	286.1	9.5
Alive	NEC	3	1	54	0.0154	1.0000	244.6	3.8
Alive	NED	4	1	11	0.1160	1.0000	48.4	5.6
Alive	SAB	1	2	33	0.0691	0.6961	152.8	10.6
Alive	SAB	2	3	101	0.0632	0.6574	641.9	40.5
Alive	SAB	3	1	19	0.0707	1.0000	82.6	5.8
Dead	SAB	2	1	101	0.0097	1.0000	641.9	6.2

C. Unidentified Turtles

Status	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV	Hooks Reported (x1000)	Estimated Catch
Unknown	GOM	1	1	173	0.0072	1.0000	353.0	2.6
Alive	GOM	3	1	82	0.0174	1.0000	458.1	8.0
Alive	MAB	1	1	50	0.0588	1.0000	35.2	2.1

Table 11. Estimated A) Serious Injury and B) Released Alive marine mammals in the pelagic longline fishery during 2015 by fishing area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations. Long-finned and short-finned pilot whale estimates reflect the apportioning of observed unidentified pilot whale takes by species based upon location and environmental conditions. Interactions where serious injury status could not be determined were prorated based on past observed serious injury rates.

A. Serious Injury

Species	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Risso's Dolphin	NEC	3	1	54	0.0279	1.0000	244.6	6.8
Unid. Dolphin	MAB	1	1	50	0.0333	1.0000	35.2	1.2
Unid. Marine Mammal	MAB	1	1	50	0.0227	1.0000	35.2	0.8
Long-finned Pilot Whale	MAB	2	1	28	0.0027	1.0000	220.3	0.6
Long-finned Pilot Whale	NEC	4	3	14	0.0133	0.5640	38.7	0.5
Short-finned Pilot Whale	GOM	1	1	173	0.0063	1.0000	353.0	2.2
Short-finned Pilot Whale	MAB	1	1	50	0.0342	1.0000	35.2	1.2
Short-finned Pilot Whale	MAB	2	2	28	0.1638	0.7076	220.3	36.1
Short-finned Pilot Whale	MAB	3	1	65	0.0285	1.0000	440.2	12.5
Short-finned Pilot Whale	MAB	4	9	104	0.1264	0.3267	286.1	36.2
Short-finned Pilot Whale	NEC	4	3	14	0.2929	0.5841	38.7	11.3
Short-finned Pilot Whale	SAB	2	1	101	0.0135	1.0000	641.9	8.6
Unid. Whale	MAB	3	1	65	0.0108	1.0000	440.2	4.8

Table 11 cont.

B. Dead

Species	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Risso's Dolphin	SAB	3	1	19	0.0675	1.0000	82.6	5.6
Short-finned Pilot Whale	FEC	2	1	24	0.0503	1.0000	101.5	5.1

C. Alive

Species	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Risso's Dolphin	MAB	4	1	104	0.0131	1.0000	286.1	3.7
Risso's Dolphin	NEC	3	1	54	0.0089	1.0000	244.6	2.2
Unid. Dolphin	MAB	3	1	65	0.0183	1.0000	440.2	8.1
Unid. Marine Mammal	GOM	1	1	173	0.0072	1.0000	353.0	2.6
Unid. Marine Mammal	MAB	1	1	50	0.0212	1.0000	35.2	0.7
Long-finned Pilot Whale	NEC	4	2	14	0.0049	0.7770	38.7	0.2
Short-finned Pilot Whale	MAB	4	4	104	0.0251	0.5913	286.1	7.2
Short-finned Pilot Whale	NEC	4	2	14	0.0999	0.7446	38.7	3.9
Short-finned Pilot Whale	SAB	2	1	101	0.0097	1.0000	641.9	6.2
Unid. Whale	MAB	3	1	65	0.0101	1.0000	440.2	4.5

Table 12. Bycatch rates for sea turtles and marine mammals in area-quarter strata that were not observed in 2016. NR indicates strata where effort cannot be reported for 2016 due to confidentiality restrictions.

A. Sea Turtles

Status	Species	Area	Quarter	# Positive Sets	#Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (X1000) 2016	Estimated Catch 2016
Alive	Leatherback	NEC	2	2	52	0.0500	0.7002	92.6	4.6
Alive	Loggerhead	NEC	2	6	52	0.1418	0.4078	92.6	13.1

B. Marine Mammals

Injury Type	Species	Area	Quarter	# Positive Sets	#Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (X1000) 2016	Estimated Catch 2016
Serious Injury	Risso's Dolphin	NEC	2	2	52	0.0403	0.7031	92.6	3.7

Table 13. Total estimated interactions and experimental takes for A) Leatherback, B) Loggerhead in the pelagic longline fishery during 2016 by fishing area. This includes estimates for strata that were not observed during 2016.

A. Leatherbacks

Area	Alive	Alive CV	Dead	Dead CV	Total	Total CV	Total 95% Confidence Interval
CAR	0	-	0	-	0	-	-
FEC	31.3	0.5684	0	-	31.3	0.5684	11.1 - 88.2
GOM	76.4	0.1974	3.6	1.0000	80.0	0.1933	55.0 - 116.5
MAB	63.3	0.3534	0	-	63.3	0.3534	32.3 - 124.1
NCA	0	-	0	-	0	-	-
NEC	55.8	0.3392	0	-	55.8	0.3392	29.2 - 106.6
NED	84.1	0.3302	0	-	84.1	0.3302	44.8 - 158.0
SAB	21.3	0.6094	0	-	21.3	0.6094	7.1 - 64.0
SAR	0	-	0	-	0	-	-
TUN	3.7	1.0000	0	-	3.7	1.0000	0.7 - 18.7
Total	335.9	0.1445	3.6	1.0000	339.5	0.1433	256.7 – 449.0

B. Loggerheads

Area	Alive	Alive CV	Dead	Dead CV	Total	Total CV	Total 95% Confidence Interval
CAR	6.1	1.0000	0	-	6.1	1.0000	1.2 - 31.3
FEC	48.9	0.4802	0	-	48.9	0.4802	20.0 - 119.4
GOM	4.3	1.0000	0	-	4.3	1.0000	0.8 - 21.7
MAB	9.5	0.7041	0	-	9.5	0.7041	2.7 - 32.9
NCA	0	-	0	-	0	-	-
NEC	16.9	0.3875	0	-	16.9	0.3875	8.1 - 35.2
NED	5.6	1.0000	0	-	5.6	1.0000	1.1 - 28.7
SAB	56.9	0.4963	6.2	1.0000	62.5	0.4445	27.2 - 143.6
SAR	0	-	0	-	0	-	-
TUN	0	-	0	-	0	-	-
Total	148.2	0.2634	6.2	1.0000	153.8	0.2517	94.6 – 249.9

Table 14. Total estimated interactions with marine mammals in the pelagic longline fishery during 2016.

A. Atlantic

Species	Estimated Alive	CV Alive	95% CI Alive	Estimated Serious Injury	CV Serious Injury	95% CI Serious Injury	Estimated Dead	CV Dead	95% CI Dead
Long-finned pilot whale	0.2	0.7796	0.0 - 0.7	1.1	0.5949	0.4 - 3.3	0	-	-
Risso's dolphin	5.9	0.7315	1.6 - 21.3	10.5	0.6924	3.1 - 36.0	5.6	1.0000	1.1 - 28.5
Short-finned pilot whale	17.2	0.4667	7.2 - 41.2	106.0	0.3080	58.7 - 191.3	5.1	1.0000	1.0 - 26.1
Unidentified dolphin	8.1	1.0000	1.6 - 41.2	1.2	1.0000	0.2 - 6.0	0	-	-
Unidentified marine mammal	0.7	1.0000	0.1 - 3.8	0.8	1.0000	0.2 - 4.1	0	-	-
Unidentified whale	4.5	1.0000	0.9 - 22.8	4.8	1.0000	0.9 - 24.3	0	-	-

B. Gulf of Mexico

Species	Estimated Alive	CV Alive	95% CI Alive	Estimated Serious Injury	CV Serious Injury	95% CI Serious Injury
Short-finned pilot whale	0	-	-	2.2	1.0000	0.4 - 11.3
Unidentified marine mammal	2.6	1.0000	0.5 - 13.0	0	-	-

Figure 1. Pelagic longline fishing areas in the North Atlantic Ocean: CAR = Caribbean, GOM = Gulf of Mexico, FEC = Florida East Coast, SAB = South Atlantic Bight, SAR = Sargasso Sea, MAB = Mid-Atlantic Bight, NEC = Northeast Coastal, NED = Northeast Distant, NCA = North Central Atlantic, TUN = Tuna North, TUS = Tuna South. Year-round closed areas in the De Soto Canyon (A) and the Florida East Coast (B) are indicated along with seasonal closures in the Charleston Bump (C) and in the Mid-Atlantic (D).

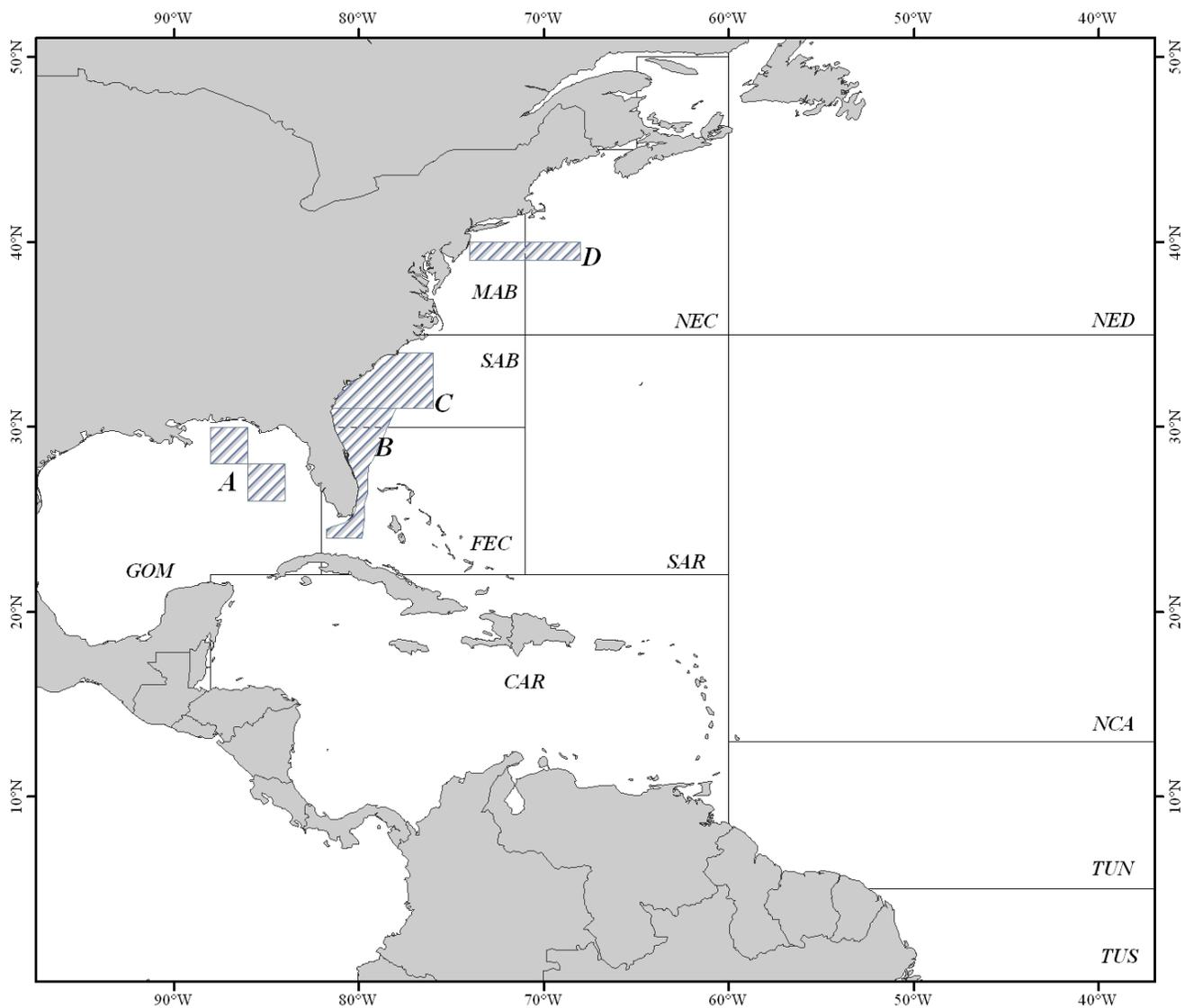


Figure 2. Observed (gray circles) and reported (black circles) pelagic longline fishing effort during 2016.

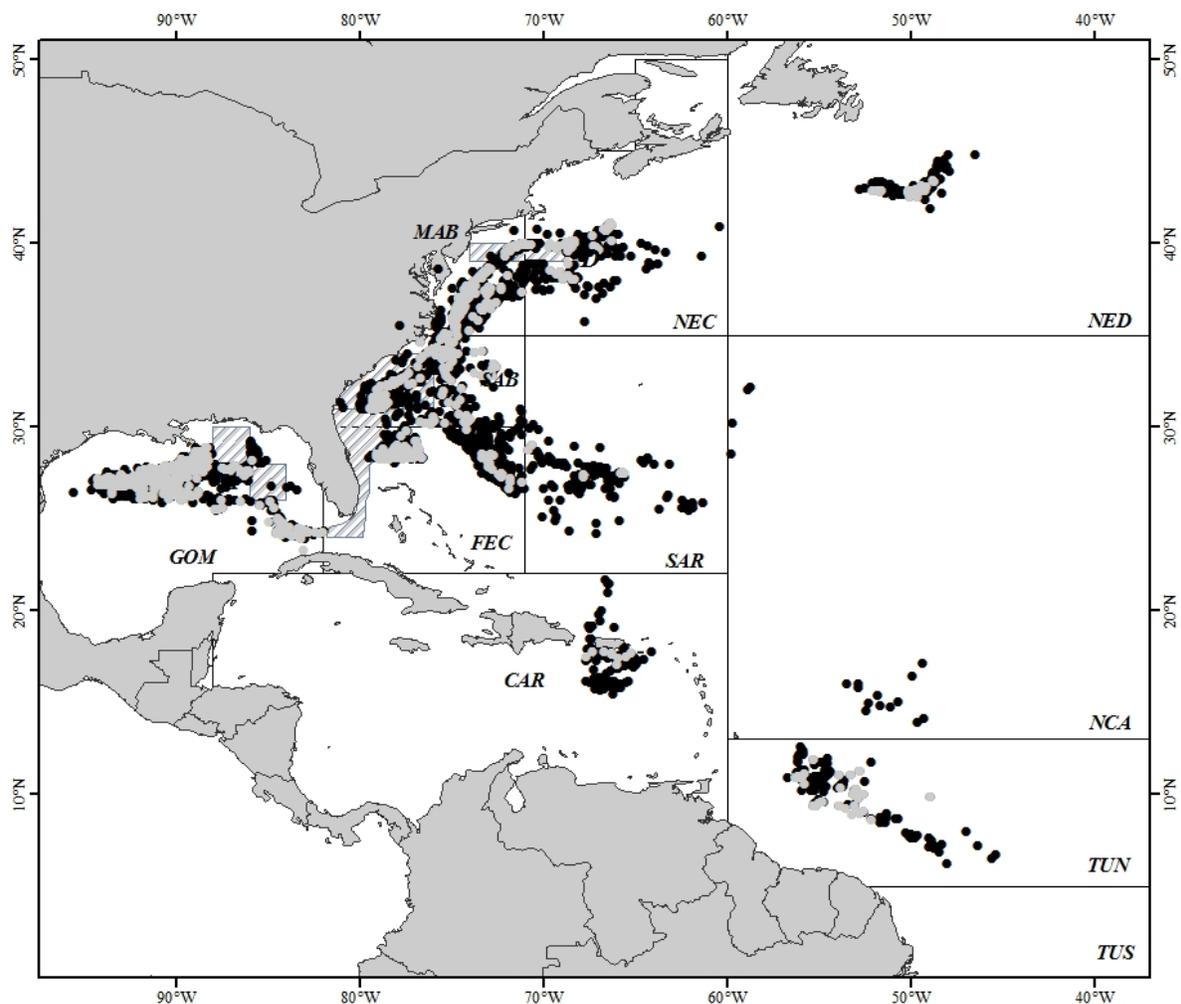


Figure 3. Observed pelagic longline fishing effort and sea turtle interactions during 2016

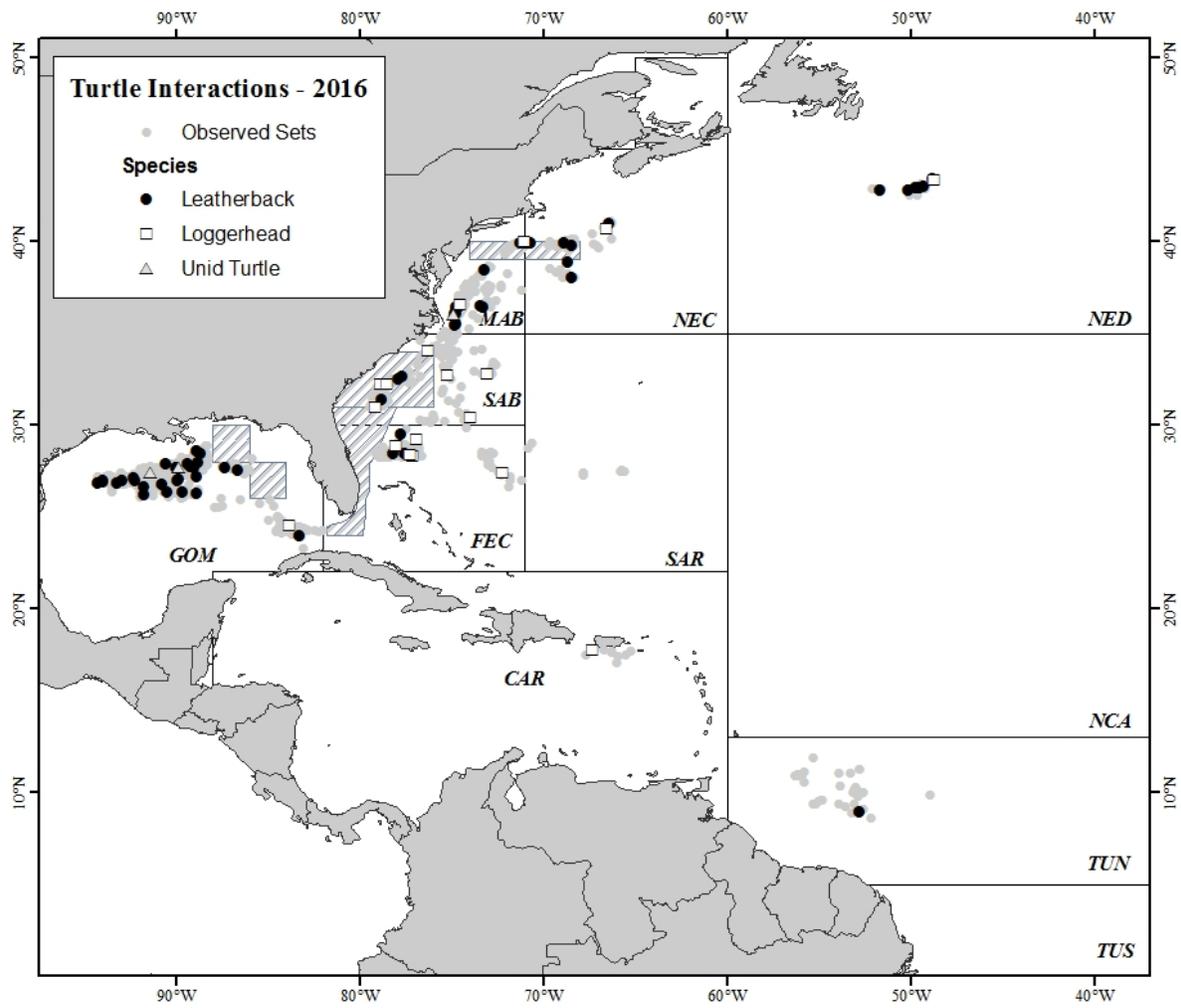


Figure 4. Observed pelagic longline fishing effort and marine mammal takes during 2016.

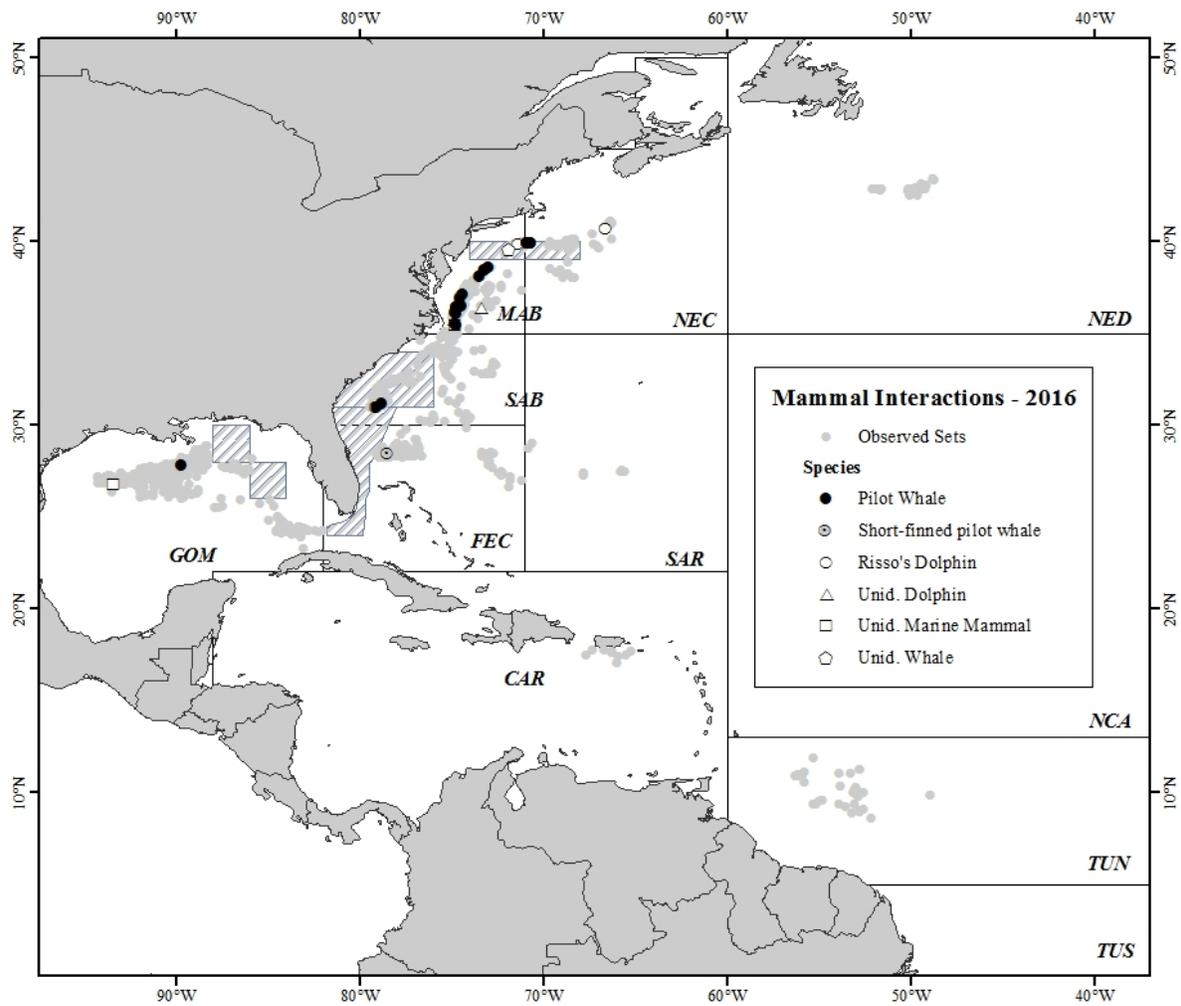
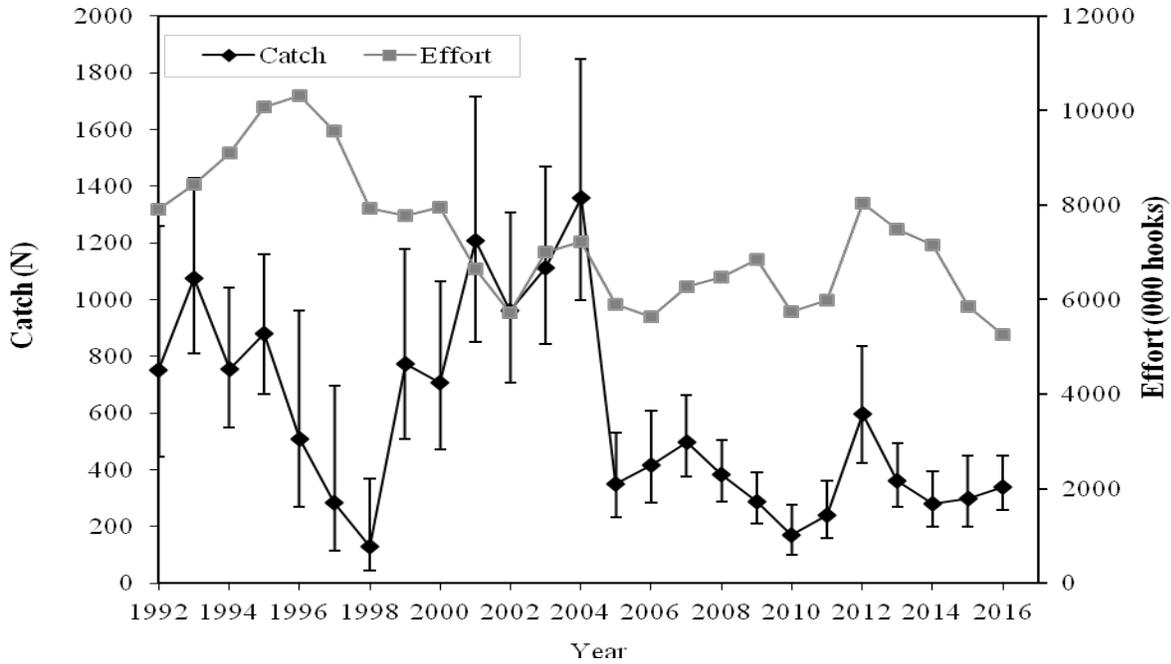


Figure 5. Historical trends in fishery effort and estimated marine turtle takes in the pelagic longline fishery from 1992 to 2016 for A) Leatherback Turtles, and B) Loggerhead Turtles. Errors bars represent 95% confidence intervals.

A. Leatherback Turtles



B. Loggerhead Turtles

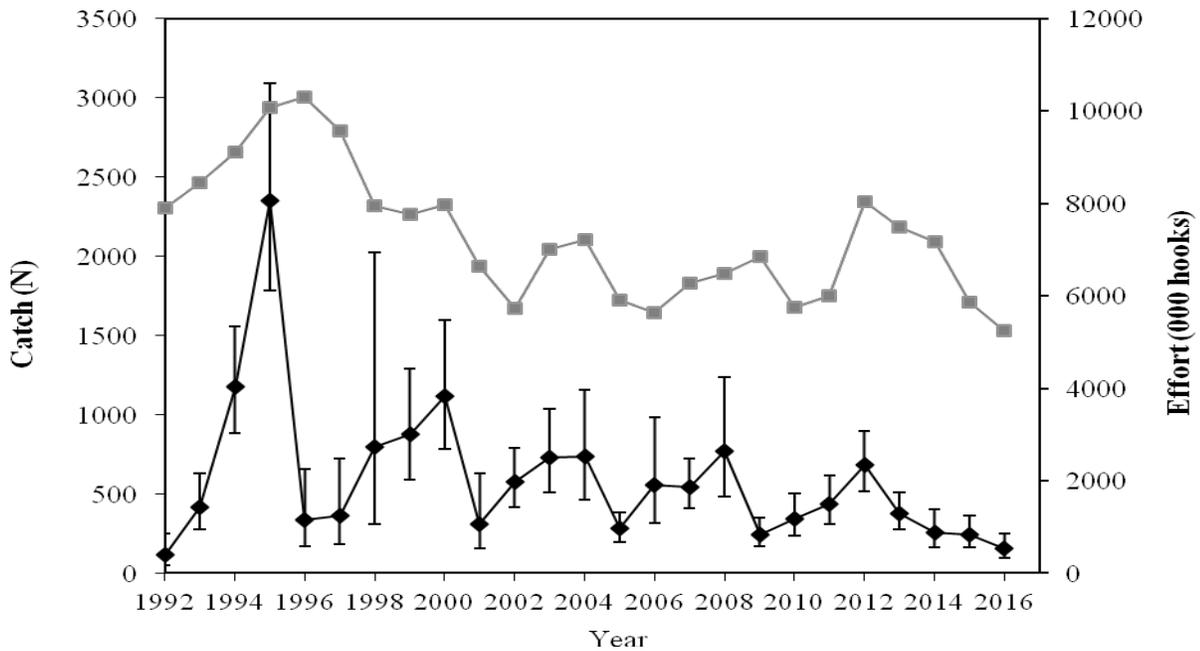
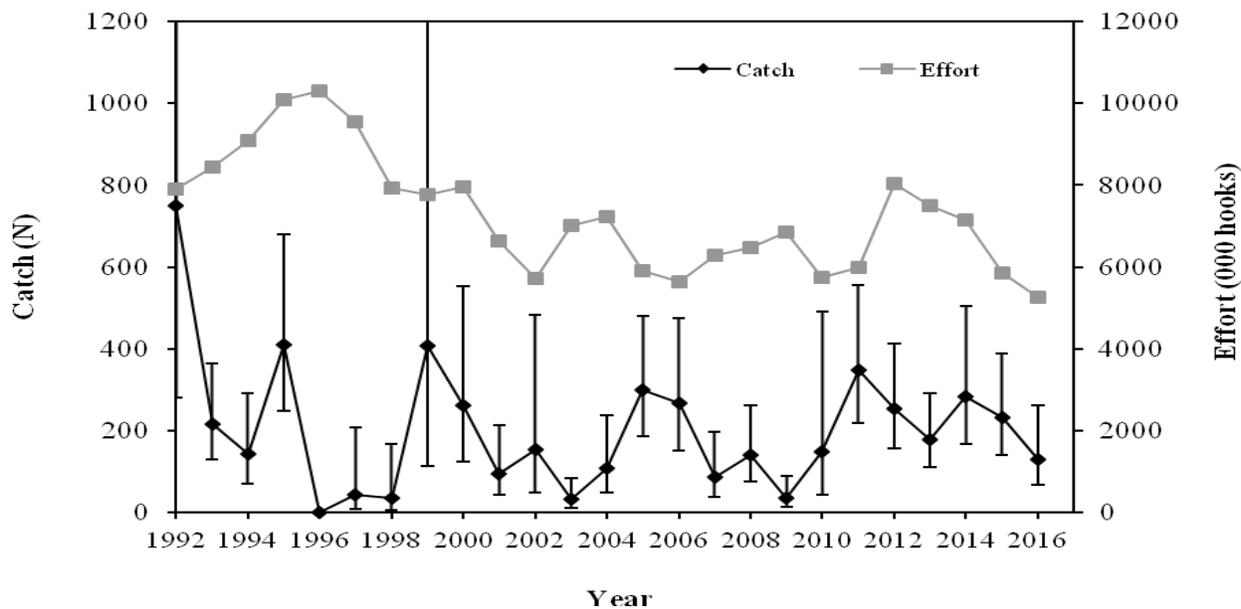
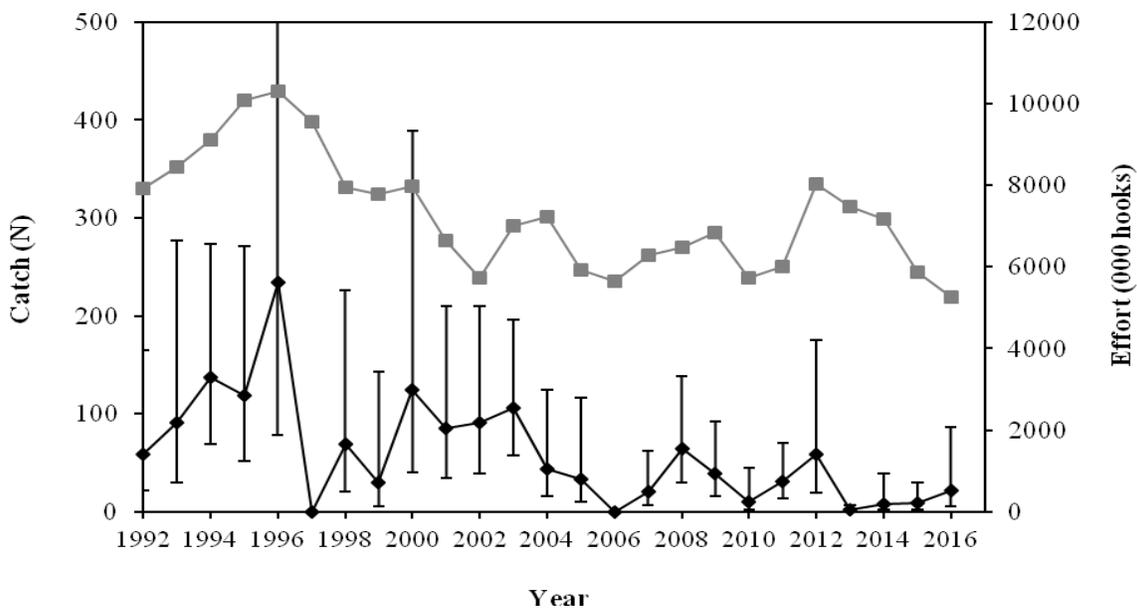


Figure 6. Historic trends in fishery effort and estimated marine mammal takes in the pelagic longline fishery from 1992 to 2016 for A) Pilot Whales and B) Risso’s Dolphins in Western North Atlantic waters. Errors bars represent 95% confidence intervals. For pilot whales, all takes are most likely of short-finned pilot whales.

A. Pilot Whales



B. Risso’s Dolphins



Appendix A. Sea Turtle Life History Form

SEA TURTLE LIFE HISTORY FORM

02/2012

CAPTURE INFORMATION

TRIP YEAR 20 MONTH DAY

SET/HAUL/TOW SPECIMEN NUMBER BY TRIP EXPERIMENTAL Y / N?
(if Y, note project name in comments)

GEAR TYPE: Longline Gill Net _____ Trawl _____ (note time in comments)
 GEAR DEPTH: Surface Midwater _____ Bottom Other _____

TARGET CATCH: _____ TIME (24 hr) WATER TEMP (°F) .

LATITUDE deg min N / S LONGITUDE deg min E / W

Did turtle slide out/escape from gear? Y / N Was turtle brought on board? Y / N

IDENTIFICATION (see back) Number of Photos Taken?

SPECIES: Leatherback Loggerhead Kemp's ridley Green Hawksbill Olive ridley
 Unidentified Hardshell Unknown

CONDITION OF TURTLE AT CAPTURE Injured Uninjured Unknown
(Please check injury status above as well as condition below; complete condition evaluation on p. 2 for any not coded "alive")

Previously dead Fresh dead/comatose/unresponsive Attempted resuscitation? Y / N
 Alive Unknown (describe) Other (describe)

IF GEAR IS A FORM OF HOOK AND LINE, COMPLETE THIS SECTION, AS APPLICABLE:

HOOK TYPE "J" Circle other (describe) _____ SIZE / 0
 MANUFACTURER/STYLE NO. _____ DEGREE OFFSET °

BAIT Squid Mackerel Sardine Unknown Other (describe) _____ SIZE _____

Caught on hook timer? Y / N If yes, fill in time elapsed

Was light stick on hook? Y / N / U / Not Applicable If No, number of gangions to next light stick

Light stick type (circle) : Chemical / LED
 Light stick color (circle)? White, Pink, Blue, Green, Black, Red, Yellow, Purple, Other, Unknown
 Number of gangions to next float

HOOK LOCATION (See Appendix in manual for descriptive figures)
(circle specific location; check box if specifics are not known; annotate drawing on reverse to indicate location as needed):

Not Hooked Not Known if Hooked Hooked, but location totally Unknown Holding bait/hook

Internal: Unknown, internal
 Swallowed (Esophagus) Hook visible? Visible to insertion point / Partial hook / Not visible
 Beak/ Mouth (Circle one) Jaw Location (Check one) upper lower side (mouth only)
 Check one for mouth: tongue glottis roof of mouth jaw joint other (describe)

External: Unknown, external Beak/Head/Neck Carapace/Plastron
 Front Flipper/Shoulder/Armpit Rear Flipper/Groin/Tail

Was hook recovered from this animal? Y / N / Unknown / Not Applicable

Was animal entangled in gear? At capture? Y / N / Unknown At Release? Y / N / Unknown
 How much gear (linear feet) was left on turtle when released? . ft. (estimated/measured)

Appendix B. Details of Sea Turtle and Marine Mammal Interactions

Table B1. Gear types and hooking locations based upon observed comments and the sea turtle life history form for each A) Leatherback, B) Loggerhead, and C) Other species turtles observed during 2016. These data are summarized in Tables 5 and 6. Q indicates calendar quarter, “CL Est.” indicates an estimated carapace length in feet, “CCL” indicates a measured curved carapace length in cm, and “N-N” indicates a straight line measurement of the turtle carapace from notch to notch (see Appendix A). “Injury Cat. Row” and “Release Cond. Col.” refer to rows and columns, respectively, for post-release mortality assignments in SEFSC 2012.

A. Leatherback Turtles

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed ?	Entangled Capture?	Entangled Release?	Injury Cat. Row	Release Cond. Col	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
1	GOM	1	C-16/0	0	Squid	180	Alive injured	Released alive	Armpit	No	No	No	I	B	6.0	6.0		
2	GOM	1	C-16/0	0	Squid	149	Alive injured	Released alive	Armpit	No	No	No	I	C	0.5	5.0		
3	GOM	1	C-16/0	0	Sardine	99	Alive injured	Released alive	Unknown internal	No	No	No	IV	B	8.0	5.0		
4	GOM	1	C-16/0	0	Squid	99	Alive injured	Released alive	Shoulder	No	No	No	I	B	5.0	6.0		
5	GOM	1	C-16/0	0	Squid	140	Alive injured	Released alive	Armpit	No	No	No	I	B	5.0	4.5		
6	GOM	1	C-16/0	0	Squid	140	Alive injured	Released alive	Front flipper/shoulder/armpit	No	No	No	I	B	6.0	5.0		
7	GOM	1	C-16/0	0	Squid	225	Alive injured	Released alive	Unknown location	No	Unknown	Unknown	IV	A	142.0	UNK		
8	GOM	1	C-16/0	0	Squid or Herring	113 or 90	Alive injured	Released alive	Shoulder	Yes	No	No	I	D	0.0	3.5		
9	GOM	1	C-16/0	0	Squid or Herring	113 or 90	Alive injured	Released alive	Unknown location	No	No	No	IV	B	20.0	4.0		
10	GOM	1	C-16/0	0	Squid	257	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	5.0		
11	FEC	1	C-16/0	0	Squid or Mackerel	243 or 342	Alive unknown	Released alive	Not known if hooked	No	Unknown	Unknown	IV	A	75.0	5.0		

Appendix B, Table B1, A. Leatherback Turtles cont.

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed ?	Entangled Capture?	Entangled Release?	Injury Cat. Row	Release Cond. Col.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
12	SAB	1	C-16/0	0	Squid	225	Alive injured	Released alive	Not hooked, holding bait	Yes	No	No	V	D	0.0	4.0		
13	FEC	1	C-16/0	0	Squid	216	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	7.0		
14	GOM	1	C-16/0	0	Squid	126	Alive injured	Released alive	Unknown location	Unknown	Yes	No	IV	C	0.0	5.0		
15	GOM	1	C-16/0	0	Squid	135	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	5.0		
16	FEC	1	C-16/0	0	Squid	234	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	4.0		
17	GOM	2	C-16/0	0	Other	77	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	5.0		
18	GOM	2	C-16/0	0	Pacific saury	72	Alive injured	Released alive	Unknown location	No	No	No	IV	B	15.0	3.0		
19	GOM	2	C-16/0	0	Pacific saury	122	Alive injured	Released alive	Front flipper	No	No	No	I	B	3.0	6.0		
20	GOM	2	C-16/0	0	Pacific saury	126	Alive injured	Released alive	Unknown location	No	No	No	IV	B	20.0	6.0		
21	GOM	2	C-16/0	0	Sardine	90	fresh dead/comatose/unresponsive	Dead	Not known if hooked	No	Yes	No	IV	Dead	0.0	5.0		
22	GOM	2	C-16/0	0	Squid	104	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	C	0.0	5.0		
23	GOM	2	C-16/0	0	Squid	104	Alive injured	Released alive	Armpit	No	No	No	I	B	2.0	4.0		
24	GOM	2	C-16/0	0	Squid	104	Alive injured	Released alive	Unknown, internal	No	No	No	IV	B	2.5	4.5		

Appendix B, Table B1, A. Leatherback Turtles cont.

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Injury Cat. Row	Release Cond. Col	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
25	GOM	2	C-16/0	0	Squid	108	Alive injured	Released alive	Shoulder	No	No	No	I	C	2.0	4.5		
26	GOM	2	C-16/0	0	Squid	108	Alive injured	Released alive	Unknown, external	No	No	No	I	B	3.0	5.0		
27	GOM	2	C-16/0	0	Mackerel	216	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0		67.0	55.0
28	GOM	2	C-16/0	0	Pacific saury	104	Alive injured	Released alive	Armpit	No	No	No	I	B	5.0	5.0		
29	GOM	2	C-16/0	0	Squid	99	Alive injured	Released alive	Unknown location	Yes	Unknown	No	IV	D	0.0	5.0		
30	GOM	2	C-16/0	0	Squid	117	Alive injured	Released alive	Carapace	Yes	Yes	No	I	D	0.0	6.0		
31	GOM	2	C-16/0	0	Squid or Pacific saury	198 or 149	Alive injured	Released alive	Not hooked holding bait	No	Yes	Yes	V	A	2.5	6.5		
32	TUN	2	C-16/0	0	Squid	135	Alive injured	Released alive	Shoulder	No	No	No	I	C	2.0	6.0		
33	GOM	2	C-16/0	0	Sardine	90	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	5.0		
34	NED	3	C-16/0 or C-18/0	0 or 10	Mackerel	464	Alive injured	Released alive	Shoulder	No	No	No	I	C	1.0	5.0		
35	NED	3	C-16/0	0	Mackerel	464	Alive injured	Released alive	Front flipper	No	No	No	I	C	0.3	5.0		
36	NED	3	C-16/0 or C-18/0	0 or 10	Mackerel	464	Alive injured	Released alive	Shoulder	No	No	No	I	C	1.5	5.0		

Appendix B, Table B1, A. Leatherback Turtles cont.

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Injury Cat. Row	Release Cond. Col.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
37	NED	3	C-16/0 or C-18/0	0 or 10	Mackerel	464	Alive injured	Released alive	Shoulder	No	No	No	I	C	1.5	5.0		
38	NED	3	C-16/0 or C-18/0	0 or 10	Mackerel	464	Alive unknown	Released alive	Not known if hooked	No	Unknown	Unknown	IV	A	Unknown	Unknown		
39	NED	3	C-16/0 or C-18/0	0 or 10	Mackerel	464	Alive injured	Released alive	Front flipper/shoulder/armpit	No	No	No	I	C	2.0	5.0		
40	NED	3	C-16/0	0	Mackerel	464	Alive injured	Released alive	Shoulder	Yes	No	No	I	D	0.0	4.0		
41	NEC	3	C-16/0	0	Squid or Mackerel	99 or 180	Alive injured	Released alive	Shoulder	No	No	No	I	C	1.0	6.0		
42	SAB	3	C-16/0	0	Mackerel	270	Alive injured	Released alive	Armpit	No	No	No	I	B	3.0	6.0		
43	MAB	3	C-16/0	0	Squid	158	alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	8.0		
44	NEC	3	C-18/0	0	Squid	297	Alive injured	Released alive	Armpit	No	No	No	I	C	0.0	8.0		
45	NEC	3	C-18/0	10	Squid or Mackerel	306 or 342	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	4.0		
46	NEC	3	C-18/0	10	Squid	321	Alive injured	Released alive	Armpit	No	No	No	I	B	2.0	4.0		
47	NEC	3	C-18/0	10	Mackerel	252	Alive injured	Released alive	Armpit	No	No	No	I	B	3.0	3.5		
48	MAB	3	C-16/0	0	Squid	126	alive unknown	Released alive	Not known if hooked	Yes	Yes	No	III	D	0.0	5.0		

Appendix B, Table B1, A. Leatherback Turtles cont.

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Injury Cat. Row	Release Cond. Col.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
49	MAB	3	C-16/0 or C-18/0	0 or 10	Squid	125	Alive injured	Released alive	Mouth, lower jaw, unknown	No	No	No	III	C	0.5	4.0		
50	MAB	3	C-16/0	0	Squid	158	Alive injured	Released alive	Shoulder	No	Yes	No	I	B	12.0	6.0		
51	MAB	4	C-18/0 or C-16/0	10 or 0	Squid or Mackerel	180 or 270	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	6.0		
52	MAB	4	C-18/0	10	Squid	180	Alive injured	Released alive	Shoulder	No	Yes	Yes	I	A	30.0	5.0		
53	SAB	4	C-18/0	10	Squid	178	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	5.0		
54	MAB	4	C-18/0	10	Squid or Mackerel	180 or 225	Alive injured	Released alive	Unknown location	No	No	No	IV	B	20.0	5.0		
55	MAB	4	C-18/0	10	Squid or Mackerel	180 or 225	Alive injured	Released alive	Unknown location	No	Yes	Yes	IV	A	30.0	7.0		
56	NED	4	C-18/0	10	Mackerel	113	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	5.0		
57	NED	4	C-18/0	10	Mackerel	113	Alive injured	Released alive	Shoulder	No	No	No	I	C	1.0	4.5		
58	NED	4	C-18/0	10	Mackerel	113	Alive injured	Released alive	Shoulder	No	No	No	I	C	1.0	4.0		
59	NED	4	C-18/0	10	Mackerel	113	Alive injured	Released alive	Unknown location	No	No	No	IV	B	2.0	3.0		
60	NED	4	C-18/0	10	Mackerel	113	Alive injured	Released alive	Shoulder	No	No	No	I	C	1.0	5.0		

Appendix B, Table B1, A. Leatherback Turtles cont.

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Injury Cat. Row	Release Cond. Col.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
61	NED	4	C-18/0	10	Mackerel	113	Alive injured	Released alive	Unknown location	No	No	No	IV	B	3.0	4.0		
62	NEC	4	C-16/0	0	Squid or Mackerel	135 or 216	Alive injured	Released alive	Unknown location	No	Yes	No	IV	C	0.5	5.0		
63	NEC	4	C-16/0	0	Squid or Mackerel	135 or 216	Alive injured	Released alive	Shoulder	No	No	No	I	C	0.1	5.0		
64	NEC	4	C-16/0	0	Squid	135	Alive injured	Released alive	Armpit	No	No	No	I	C	0.2	5.0		
65	NEC	4	C-16/0	0	Mackerel	216	Alive injured	Released alive	Armpit	No	No	No	I	C	0.0	5.0		
66	MAB	4	C-16/0	0	Squid or Mackerel	135 or 216	Alive injured	Released alive	Unknown location	No	No	No	IV	C	1.0	6.0		
67	NEC	4	C-16/0	0	Squid	135	Alive injured	Released alive	Front flipper/shoulder/armpit	No	No	No	I	C	0.1	5.0		
68	MAB	4	C-18/0	0	Menhaden	225	Alive injured	Released alive	Mouth, side, other	No	No	No	II	C	0.0	6.0		
69	NEC	4	C-16/0	0	Squid	149	Alive injured	Released alive	Front flipper/shoulder/armpit	No	No	No	I	C	0.5	5.0		
70	MAB	4	C-16/0	0	Squid	149	Alive unknown	Released alive	Not known if hooked	No	Yes	Unknown	IV	A	60.0	4.0		

Appendix B, Table B1, B. Loggerhead Turtles

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Injury Cat. Row	Release Cond. Col.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
1	FEC	1	C-16/0	0	Squid	315	Alive injured	Released alive	Swallowed hook not visible	No	No	No	IV	C	0.3		68.0	64.0
2	SAB	1	C-18/0	10	Squid	194	Alive injured	Released alive	Mouth lower jaw other	Yes	No	No	II	D	0.0		57.0	50.0
3	SAB	1	C-18/0	10	Squid	122	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0		71.0	67.5
4	FEC	1	C-16/0	0	Squid or Mackerel	261 or 342	Alive injured	Released alive	Swallowed hook not visible	No	No	No	IV	C	0.3	2.0		
5	FEC	1	C-16/0	0	Squid or Mackerel	261 or 342	Alive injured	Released alive	Beak(internal)lower jaw	Partially	No	No	I	C	0.1	2.0		
6	FEC	1	C-16/0	0	Squid	243	Alive injured	Released alive	Swallowed hook not visible	No	No	No	IV	C	0.3	2.5		
7	GOM	1	C-16/0	0	Squid	284	Alive injured	Released alive	Front flipper	Yes	No	No	I	D	0.0	4.0		
8	SAB	2	C-18/0	10	Squid	90	Fresh dead/comatose/unresponsive	Dead	Beak (internal), lower jaw	No	No	No	I	Dead	0.0		73.1	71.1
9	FEC	2	C-16/0	0	Squid	239	Alive injured	Released alive	Mouth, lower jaw, other	No	No	No	II	C	0.1	3.0		
10	SAB	2	C-16/0	0	Squid or Mackerel	257 or 248	Alive injured	Released alive	Glottis	Yes	No	No	III	D	0.0		69.9	67.6
11	NEC	2	C-18/0	10	Squid	225	Alive injured	Released alive	Tongue	No	No	No	III	C	1.0	2.5		
12	SAB	2	C-16/0	0	Squid	45	Alive injured	Released alive	Mouth, side, other	No	No	No	II	C	0.0	5.0		
13	SAB	2	C-16/0	0	Squid or Mackerel	302 or 180	Alive injured	Released alive	Beak (internal)/mouth, lower jaw	Yes	No	No	III	D	0.0		79.0	
14	FEC	3	C-16/0	0	Squid	149	Alive injured	Released alive	Tongue	Yes	No	No	III	D	0.0	2.5		

Appendix B, Table B1, B. Loggerhead Turtles cont.

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Injury Cat. Row	Release Cond. Col.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
15	SAB	3	C-16/0	0	Squid	198	Alive injured	Released alive	Front flipper	Yes	Yes	No	I	D	0.0	3.0		
16	CAR	4	C-16/0	0	Squid	117	Alive injured	Released alive	Swallowed, hook not visible	No	Yes	No	IV	C	0.5	2.5		
17	NED	4	C-18/0	10	Mackerel	113	Alive injured	Released alive	Mouth, lower jaw, unknown	Yes	No	No	III	D	0.0			57.0 (SCL n-t)
18	MAB	4	C-16/0	0	Squid	135	Alive injured	Released alive	Mouth side other	No	No	No	II	C	0.0	3.0		
19	MAB	4	C-16/0	0	Mackerel	180	Alive injured	Released alive	Swallowed, hook not visible	No	No	No	IV	C	0.3	3.0		

Appendix B, Table B1, C. Unidentified Turtles

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Injury Cat. Row	Release Cond. Col.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
1	GOM	1	C-16/0	0	Squid	225	Unknown	Unknown	Unknown location	No	Unknown	Unknown	IV	Unk	152.0			
2	MAB	1	C-18/0 or C-16/0	10 or 0	Squid	149	Alive uninjured	Released alive	Not hooked, holding bait	Yes	No	No	V	D	0.0	2.0		
3	GOM	3	C-16/0	0	Pacific saury	131	Alive injured	Released alive	Unknown location	No	No	No	IV	B	4.0	4.0		

Appendix B cont.

Table B2: 2016 observer comments and serious injury codes for marine mammals are presented. Lengths (cm) are estimated visually by the observer. Interaction type categories are based on NMFS Serious Injury determination policy.

	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
1	Unid. Marine Mammal	UNK	CBD	Unknown	[Check boxes indicate unknown if hooked, unknown entanglement, no cut wraps, unknown amount of gear on release.] In fighting with the mammal to pull it close and cut free the line snapped and the mammal swam away. Mammal swam away quickly after the line snapped but it swam under the boat so I could not watch it.
2	Pilot Whale	420	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate animal hooked in pectoral fin. Line intentionally cut with 6 feet trailing. No entanglement] Crew reeled pilot whale to within 6 feet of boat and then cut line. Hook with 6 ft. of mono remaining. Pilot whale did not interact with any other part of gear other than one hook. Saw pilot whale surface 2-3 times when being reeled in. Once line cut, pilot whale gracefully dove beneath surface and swam away.
3	Unid. Dolphin	150	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Unknown if hooked, line intentionally cut with 10 feet trailing line. Unknown if entangled. Gear not removed from animal.] Dolphin had tangled gear all in a big mess, but I don't believe the animal itself was tangled. I saw for a split second the animal dive under the boat and that when the crew cut the line with about 10 ft. of line remaining. Once they cut the line I saw the dolphin swim away normally on the other side of the boat briefly.
4	Unid. Marine Mamma;	210	Released Alive	S5c – Hooked in any body part but hook removed or pulled out	ID indicates possible FKW, described as black coloration [Animal was hooked with line going to mouth. Hook removed. No trailing line on release. No entanglement] Animal spit the hook. Hook was not bent. The hook came out after animal changed directions. I couldn't see much as animal was so far from boat. It seemed to be swimming normally while on hook.
5	Pilot Whale	420	Serious Injury	S5a - Hook in head, S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Animal hooked with line coming from mouth. Line intentionally cut with 18 ft remaining. Not entangled.] MPW surfacing rapidly and took a single breath approximately 15 feet from starboard beam. It was identified as it breached surface and was immediately cut. About 18 ft. of monofilament line remained as well as the hook. Hook location around head. MPW surfaced and line was immediately cut. MPW re-submerged and no seen again.
6	Short-finned Pilot Whale	150	Mortality	Entanglement	[Animal entangled in mainline, hook, gangion. Entangled entirely around body, head, and mouth.] I did not witness full release - they began to cut lines and as I was securing the biopsy the whale was gone. Presumably all or partial gear was removed. Animal was dead, unresponsive, no movement, rigor.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
7	Pilot Whale	450	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Animal was hooked in the front flipper. Line cut and released with 20 ft of trailing line. Not entangled.] Captain reeled in about 10 ft of gangion and cut line when animal breached. Continued hauling when animal swam away. Once released animal dove and swam away.
8	Pilot Whale	420	Serious Injury	S5a - Hook in head, S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Animal was hooked. No indication of location on boxes. Drawing indicates mouth. Line cut with 5 ft of trailing gear. Not entangled.] The mammal was pulled close and the line was cut as close as possible. Once the line was cut the animal swam away normally with another animal, presumably a youth of the same species.
9	Pilot Whale	300	Released Alive	S5c – Hooked in any body part but hook removed or pulled out	[Animal was hooked, with line coming from head. Hook removed. Not entangled.] Pilot whale was only hooked for a short time when gangion came to boat. Hook came back to the boat bent with the barb missing. Pilot whale freed itself. Pilot whale breached surface approximately 40 feet from boat with gangion/leader going toward whale's head. Whale went under water and was never seen again. Hook came back bent with barb broken off (Pic taken of hook).
10	Pilot Whale	450	Serious Injury	S5a - Hook in head, S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Animal hooked. Indicates could not see location but may have been swallowed since line leads from mouth. Line cut with 15 ft. trailing. Not entangled] Captain pulled gangion and crew member used a line cutter and cut the line right after the swivel connecting the gangion and leader leaving 15ft of line connected to the hook still remaining with the pilot whale.
11	Risso's Dolphin	149	Mortality	Entanglement	[Not hooked. Entangled in gangion and hook around flukes] No gear was removed because the animal was dead and discarded after photos and biopsy were completed. Observer asked vessel to board marine mammal. Sunk upon release.
12	Unid. Dolphin	180	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled around flukes in mainline. All gear removed] The animal was pulled to vessel and mainline cut off the tail. The animal swam directly away from the vessel in a normal manner. Some bleeding occurred where mainline was wrapped around tail.
13	Pilot Whale	300	Serious Injury	S5a - Hook in head, S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Hooked in side of mouth. Line cut, released with 35 feet of trailing gear. Not entangled.] Capt pulled mammal as close as he could then cut the leader with mono cutters. After line was cut mammal swam away from vessel then down.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
14	Risso's Dolphin	300	CBD	S7b - Entangled before being freed without gear attached	[Unknown if hooked, gangion in mouth as part of entanglement. Entangled in mouth and lower jaw. Mainline, floats, gangion, all involved. Line cut and removed.] Longhanded line cutter was brought out and cut as close as possible to mouth. 2 gangions were in mouth but unclear if removed after line was cut. It was possible there was gear internally but no way to tell for certain, although it seemed all gear recovered. After gear was cut, animal took a breath and then dove returning to its young. Wasn't visible after animal dove. [Mom with calf nearby]
15	Risso's Dolphin	240	Serious Injury	S7b - Entangled before being freed without gear attached	[Hooked in dorsal fin. Entangled in gangion around fin. Gear removed from animal including hook] The line was pulled to the side of the boat bringing the animal close to work with. The gaff was used to secure the hook and remove it. Then line cutters removed the rest of the line attached to animal. The animal was visibly stressed rolling onto its back after the gear was removed. It then rolled onto its anterior side, took a breath and dove down to the other individual waiting. Neither was seen after they continued to dive.
16	Unid. Whale	300	CBD	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled in mainline around head/neck. Gear removed] Brought close to boat, long handled gaff undid some loop action, mainline was cut and it was freed. Dove normally. When first surfaced, tail slapping, attempts to free. After cutting/removing gear, it was ready to panic again, but was free, dove away normally.
17	Pilot Whale		CBD	Hooked – unknown location, Released with unknown amount of gear	[Hooked but unknown location. Unknown if entangled] Had line cutter ready, but mammal broke line. Did not see animal swim away.
18	Pilot Whale	450	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Hooked in anterior portion of body, location unknown. Line cut leaving 10 feet of trailing line. Not entangled] Used longhanded dehooker and line cutter and cut line as close as can. Potentially had 2 hooks. Swam at surface and then dove.
19	Pilot Whale	360	CBD	Hooked – possibly S5a, possibly S6	[Hooked in anterior portion of body, location unknown. Line cut leaving 3 feet of trailing line. Not entangled] Used longhanded and cut line as close as can and a long handled line cutter. Swam at surface and then dove.
20	Pilot Whale	450	Serious Injury	S5a - Hook in head	[Hooked in mouth. Line cut, 0.5 ft. remaining. Not entangled] Used long handled cutter w dehooker on standby. Cut line close to animal's body. Dove and swam away.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
21	Pilot Whale	300	Serious Injury	S5a – Hook in head	[Hooked in mouth. Line cut with 1 ft. remaining. Not entangled] Animal bit off hook, attempted to bring animal close to cut line. Dove down after bite off.
22	Pilot Whale	360	Released Alive	S7b - Entangled before being freed without gear attached	[Hooked. Unknown location, but not in mouth. Not entangled] Used line cutter to remove gear. Attempted to eat catch of fisherman while being released, then swam away.
23	Pilot Whale	180	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Hooked in front flipper. Line cut with 42 feet of trailing line. Not entangled.] Captain made attempts to bring animal as close as possible. Captain cut gangion at snap. Animal seemed stressed. Repeatedly breached surface and dived while hooked. Upon release, observer never saw it again. Swam below surface.
24	Pilot Whale	390	Serious Injury	S5a – Hook in head, S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Hooked, leader lead to right corner of closed mouth. Line cut with 20 feet remaining. Not entangled.] Crew pulled the animal as close to the side of the boat as possible and then cut the leader with a knife. Animal pulled away vigorously and immediately dove out of view.
25	Risso's Dolphin	180	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled in mainline around front flipper and dorsal fin. Gear removed with no wraps] Dolphin surfaced with mainline wrapped one time around left from flipper. Dolphin rolled around and its dorsal fin became wrapped as well. Crew tried to unwrap dolphin for 2.5 minutes. Dolphin eventually freed itself and swam away. Once dolphin freed itself, it immediately swam downward and out of sight. Dolphin appeared to be unharmed.
26	Pilot Whale	300	Serious Injury	S5a – Hook in head, S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Hooked in mouth or swallowed, hook not seen. Line cut with 8 feet remaining. Not entangled] Captain pulled leader as close as MPW allowed then cut with line cutter on pole. Leader and float snaps side by side on mainline. Whale not tangled. Powerful, not excited.
27	Pilot Whale	450	CBD	Possible S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Unknown if hooked or entangled. Line was cut leaving 15 feet remaining on animal.] Pulled animal in about 15ft. From boat and cut the line. Didn't see the hook or any entanglements, but about 15 feet of line was left trailing when animal swam away. Line was cut and animal swam away normally.
28	Pilot Whale	300	CBD	Possible S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Unknown if hooked or entangled. Line cut with 20 feet remaining] Animal was pulled in about 20 ft from boat then the line was cut. 20 ft trailing line but did not see hooking or entanglement. Line was cut and animal swam away normally. Very short interaction time. Line cut almost immediately after noticed on line.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
29	Pilot Whale	450	CBD	Possible S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Unknown if hooked or entangled. Line cut with 25 feet remaining] When animal was first noticed on the line, the line was cut immediately about 25 ft from the boat. Did not get to see hooking or entanglements, but about 25 ft. of line trailing from the animal. Line cut immediately in hopes I wouldn't see. Animal swam away normally as far as I could see.
30	Pilot Whale	240	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled around tail/flukes in mainline and dropline. Gear removed and wraps cut] Multiple wraps around tail, all gear cut off with LaForce line cutter, gear a mess. Calm until they pulled it close to boat then excited, after free it disappeared.
31	Pilot Whale	180	Serious Injury	S5a – Hooked in head	[Hooked, line going into whales mouth. Not entangled] gear a mess due to MPW towing gear, line pulled as tight as MPW allowed then cut with line cutter, MPW disappeared. MPW fairly calm, Capt. Pulled MPW as close to boat as MPW allowed then cut line. 5 feet of trailing line noted in diagram.
32	Pilot Whale	270	Serious Injury	S5a – Hooked in head	[Hooked in mouth, hook visible to insertion point. Line cut with 2 feet remained. Not entangled. Noted small animal] Captain quickly instructed crew to cut animal. Crew cut line with long handle line cutter. Once animal was cut off line, animal swam away. Never saw it breach the surface after cut off line.
33	Pilot Whale	360	Serious Injury	S5a – Hooked in head, S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Hooked in side of mouth, hook visible. Line cut with 15 feet trailing. Not entangled] Pulled animal in about 15 ft from boat and line was cut. Could see hook on side of mouth. About 15 ft. of line was trailing on animal after cut. Animal swam away normally after line was cut.

